



technology opportunity

Nano-Encapsulated Aerogel



The National Aeronautics and Space Administration (NASA) seeks interested parties for the commercial application of a patented nano-encapsulated aerogel technology that was developed by engineers at the Johnson Space Center. Aerogel, nicknamed solid smoke, has been used in a variety of space missions for its properties as the lowest-density solid known. Aerogel's low density makes it useful as a lightweight structural material, and its low thermal conductivity makes it a highly efficient insulating material. Encapsulating the aerogel expands its uses when exposed to vibration and compression while improving its flexibility.

Benefits

- **Composition:**
 - Aerogel network encased in polymer
 - Extremely light-weight
- **Capabilities:**
 - Insulation for acoustic and thermal uses
 - Filtering ability for gases and fluids
 - Negligible weight increase when installed
 - One inch of aerogel is equal to 10 inches of fiberglass insulation batting
- **Strength:**
 - Increased value based on coating material
 - Fewer particulates generated
 - Can be pre-formed into shapes or machined

Applications

- **Acoustic Insulation**
- **Thermal Insulation**
- **Particle Capture**
- **Fluid & Gas Absorption**
- **Color Changing Sensor**
- **Filtering**
- **Catalyst Support**

Technology Status

- ☒ Patent Pending
- ☒ U.S. Patent(s)
- ☐ Copyrighted
- ☒ Available to License
- ☐ Available for No-Cost Transfer
- ☒ Seeking Industry Partner for Co-Development

Technology Details

Why it was Developed

NASA-Johnson Space Center is researching methods to coat Aerogel insulation in order to make it better able to withstand vibration, mechanical compression and flexure, and other environmental damage. Coating aerogel protects it from disintegration and shields it from adsorbing humidity or other gases, which could bind to the substance and change its properties.

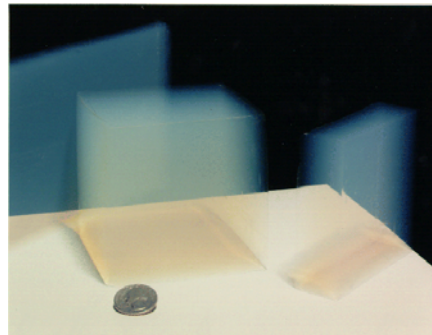
How it Works

The coating process is done on the microscopic level and can use a variety of monomers. The resulting polymer permeates the aerogel's microstructure, strengthening it and reducing fragmentation even if the aerogel matrix itself suffers some breakage, thereby maintaining its insulation value and alleviating environmental concerns about the scattering of particles. The goal of the encapsulation process is to maintain most of the porosity and insulation value of the aerogel. This coating process is expected to greatly increase the material's strength as well as improve its flexibility.

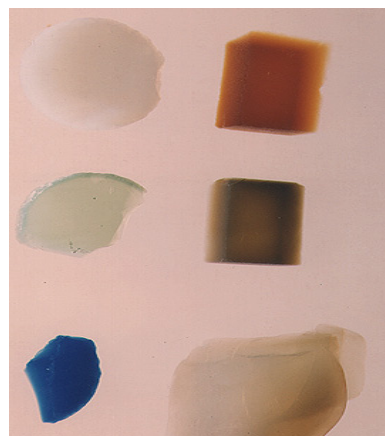
As seen to the right, coating materials can include metals or other compounds. Blue is nickel; pale green is copper; orange is iron oxide; black is carbon and iron; the remaining samples are coated with organic compounds. These are examples that rugged catalyst support with high surface area is possible.

Areas That Benefit

The new technology would allow aerogel to be marketed in previously under-tapped areas for uses such as a space-saving thermal insulator, since the current form has a greater R-value in a smaller volume than other thermal materials. Other uses for the technology include gas adsorbents, acoustic insulation, color-changing gas sensors, catalyst supports, fire blocks, high-efficiency filters, as well as to capture fragments from penetrating particles.



Aerogels scatter shortwave light to look bluish, but are generally considered transparent.



Aerogel samples with various metallic coatings.

Patents

NASA has patented this technology (U.S. 7,270,851) with a second patent pending.

Licensing and Partnering Opportunities

This technology is part of NASA's Innovative Partnerships Program (IPP), which seeks to transfer technology from and to NASA for benefit of the space program and U.S. industry.

NASA invites companies to consider licensing the Nano-Encapsulated Aerogel technology (MSC-23563) for commercial applications.

For More Information

If you would like more information or want to pursue transfer of this technology please contact us at:

Innovation Partnerships Office
NASA Johnson Space Center
Phone: 281-483-3809
Email: jsc-techtran@mail.nasa.gov
Web: <http://technology.jsc.nasa.gov>